Schedule "A"
Project Plan

1 - Background

The Mediterranean is one of the economically most important seas in the world and its only natural entrance is the Strait of Gibraltar. All sea life and commerce passes through this 15km passage and the high evaporation rate causes dense hypersaline water to form and sink inside. This leads to surface inflow from the North Atlantic and bottom outflow of Western Mediterranean Deep Water that flows into the Atlantic and affects the deep ocean thermohaline circulation called the global "air conditioner". This system is vulnerable to climate change and may have positive feedback effects. The currents can be very variable under the influence of wind and tide and regulate the movements of both commercial and conservation species. The Gibraltar Line is ideally suited to monitor and understand all of these phenomena. It is deep enough to avoid interference from commercial traffic and operates as a continuous ocean observation system to detect rare events, both oceanographic and biological. It complements satellite observations of surface waters. There are plans to monitor species including iconic whales, turtles and tuna, as well as commercial bream, cuttlefish, octopus, squid and eels. The Line itself has been carefully surveyed and will require 26km of equipment to avoid excessive depths and currents as well as trawlable bottom. The highest profile species is the bluefin tuna which can sell for over $100,000 each and were recently proposed and denied CITES status after years of overfishing. This is a perfect opportunity for OTN to provide high quality information to its partners and influence international policy. _

2 - Initial Array Design

Because of the challenging oceanographic nature of the Gibraltar Strait and its complex bathymetric profile, it has been decided that an initial test phase would take place prior to the full deployment of the acoustic array between Spain and Morocco. During this initial test phase, three or four Vemco VR4 acoustic receivers will be deployed in the deeper part of the strait using different types of mooring designs. We will be assessing receiver acoustic telemetry efficiency, underwater modem communication efficiency, mooring design, and mooring location using a combination of fixed sentinel-tag locations at various depths and ship-based range tests. It is expected that the results of this data will provide invaluable information for the full deployment phase of the receiver array, but also guidelines for trackers and taggers using Vemco acoustic transmitters in that region. The test phase is scheduled for 8 to 16 December 2011 (first cruise) and late January/February 2012 onboard RV Ramón Margalef (IEO, Spain).

Therefore the Strait of Gibraltar acoustic array deployment would be a two-phase process. An initial test phase planned in the fall-winter of 2011-12, while the full completion of the line is to

be determined depending on the test phase results. _The following information contained in this project plan is intentionally divided into a test phase and a full-deployment phase.

A) Equipment and services:

1. Test- Phase
    a. Dalhousie will provide for the test-phase:
        i. 5 acoustic receivers: Vemco VR4 unit with five year life lithium battery pack (4 will be designated for deployment and 1 will be designated as a spare);
        ii. 7 acoustic releases: Ore Offshore Port MFE with long life battery pack (6 will be designated for deployment and 1 will be designated as a spare);
        iii. 1 VR100 acoustic receiver (on loan);
        iv. 5 VR2W acoustic receivers (on loan);
        v. 1 surface deck unit: Teledyne Benthos Universal Deck Box UDB-9000-M;
        vi. 1 Ore Offshore deck unit;
        vii. Sentinel tags, tilt loggers, and range test tags (on loan);
        viii. One technical officer will be travelling to Spain at OTN's expense to provide support during the deployment and the range testing for up to 10 days.
        ix. 4 different floatation devices (on loan);
            1. Kintama (VR4), SUBS (VR4), CROM (VR4) and 16" hardball (VR2W). ROMOR prototype elliptical float (VR4) may also be available.

        The floats will be provided on loan for testing purposes. The objective is to determine which mooring system will work most effectively. The outcome of this test will most likely determine the mooring system for future deployments.

    b. Partner will provide for test-phase:
        i. Two additional mooring system (anchor, flotation, hardware, rope);
        ii. Planned positions and related bathymetric data (multibeam, sidescan sonar, etc)
        iii. ADCP and its associated mooring
        iv. Deployment/recovery boat time and vessel support personnel
        v. Range testing boat time

vi. Technical support personnel

1. Full-deployment Phase:

   a. Dalhousie will provide for the full-deployment phase:

      i. 31 acoustic receivers: : Vemco VR4 unit with five year life lithium battery pack;

      ii. 29 acoustic releases: Ore Offshore Port MFE with long life battery pack ;

      iii. 1 Benthic pod;

      iv. One (or two) technical officers at OTN's expense to provide support during the deployment for up to 10 days.

   b. Partner will provide for full deployment phase:

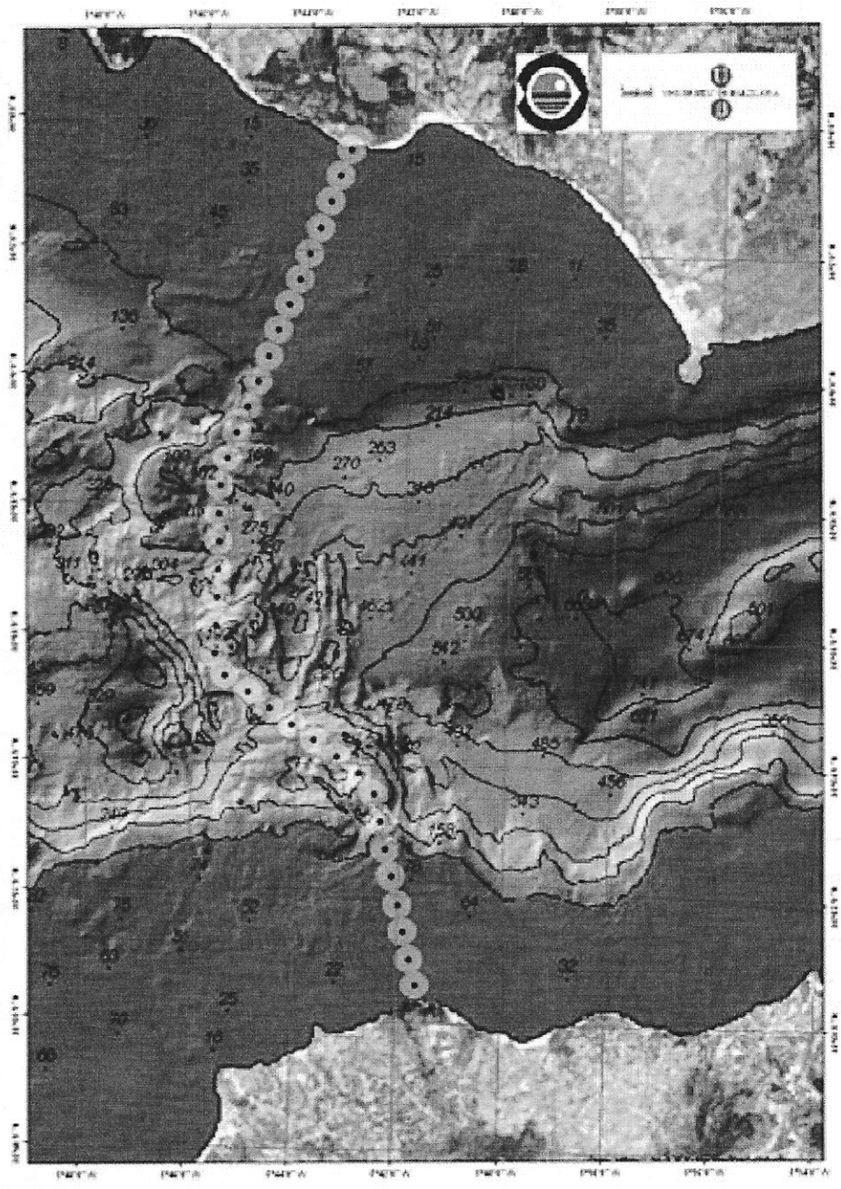
      i. 35 mooring systems (to be determined after results are analyzed from the test phase) for the VR4 (anchor, flotation, hardware, rope);

      ii. Deployment/recovery/download boat time and vessel support personnel; and

      iii. Technical support personnel for deployment/recovery/download.

B) Proposed Line Location:

The Strait of Gibraltar Line will be located between the coast of Spain and Morocco. The line is composed of 35 stations (See maps below).
Details of the deployment geometry (spacing between stations and depth of receivers) are for illustrative purpose as changes might be required upon analysis of the test phase data.



C) Bathymetry Information:

The bathymetry map shown above is intended for illustrative purposes. Detailed multibeam bathymetry data owned by the Spanish partners will be shared with OTN once the planning for the test phase and full deployment phase have begun.

D) Proposed Receiver Locations:

These proposed receiver locations are approximations and are subject to change upon review by the OTN Deployment Committee and Spanish collaborators after the test phase.

Station	Latitude	Longitude	Depth (m)
SG001	36.0594966	-5.7197929	-5.65
SG002	36.0528875	-5.7229171	-18.77
SG003	36.0461444	-5.7258768	-26.79
SG004	36.039	-5.7290832	-31.16
SG005	36.0326563	-5.7325362	-30.41
SG006	36.0258781	-5.7354137	-23.86
SG007	36.0191326	-5.73862	-32.90
SG008	36.0125201	-5.7418264	-47.22
SG009	36.0055063	-5.7447038	-57.14
SG010	35.998926	-5.7481569	-65.25
SG011	35.9921783	-5.751322	-80.87
SG012	35.9855636	-5.7544462	-162.10
SG013	35.9789482	-5.7574059	-156.60
SG014	35.9718311	-5.759708	-141.40
SG015	35.96468	-5.7597079	-158.30
SG016	35.9574613	-5.7595435	-195.70
SG017	35.950242	-5.7596258	-297.40
SG018	35.9429886	-5.7594613	-282.90
SG019	35.935768	-5.7599546	-213.10
SG020	35.9284129	-5.760119	-208.50
SG021	35.9227958	-5.7568304	-256.40
SG022	35.9185493	-5.749349	-275.80
SG023	35.9143361	-5.7421964	-332.70
SG024	35.9101894	-5.7350437	-272.60
SG025	35.9063102	-5.7281377	-257.90
SG026	35.9019959	-5.7206972	-298.10
SG027	35.897648	-5.7135447	-209.40
SG028	35.8922963	-5.7083651	-154.50
SG029	35.8852717	-5.7059809	-171.10
SG030	35.8783803	-5.7043366	-84.40
SG031	35.8714213	-5.7023635	-58.80
SG032	35.8641606	-5.7000204	-51.30
SG033	35.8574012	-5.6984583	-41.00
SG034	35.8503066	-5.6959919	-36.22
SG035	35.8432113	-5.6940187	-17.68

Summary of mooring counts by 50-meter depth zone (subject to change depending on detailed bathymetry).

1-50m	51-100m	101-150m	151-200m	201-250m	251-300m	301-350m	total
11	6	1	6	3	7	1	35

3 - Deployment Schedule

The deployment of the 4 acoustic receivers for the test-phase is planned for 8-16 December 2011. Recovery of the test phase moorings is planned for late January/February 2012.

The full deployment of the Strait of Gibraltar line will take place following analysis of test-phase data (2012).

4 - Maintenance Schedule

It is expected that service trips to the Gibraltar Line will take place (at a minimum) once a year, at which time batteries will be changed if needed in the receivers and acoustic releases, and biofouling will be removed from the receivers and acoustic releases. Maintenance checks and upgrades (at a minimum batteries and corroded parts will be replaced, where applicable, full replacement units will be provided) will be performed during those trips.

5 - Data Retrieval Schedule

Data will be uploaded from the receivers once a year, and submitted to OTN in the manner outlined in the OTN Data Management Policy.

6 - Mooring Design

Four different VR4 mooring types (figure 1) will be deployed during the Test phase.

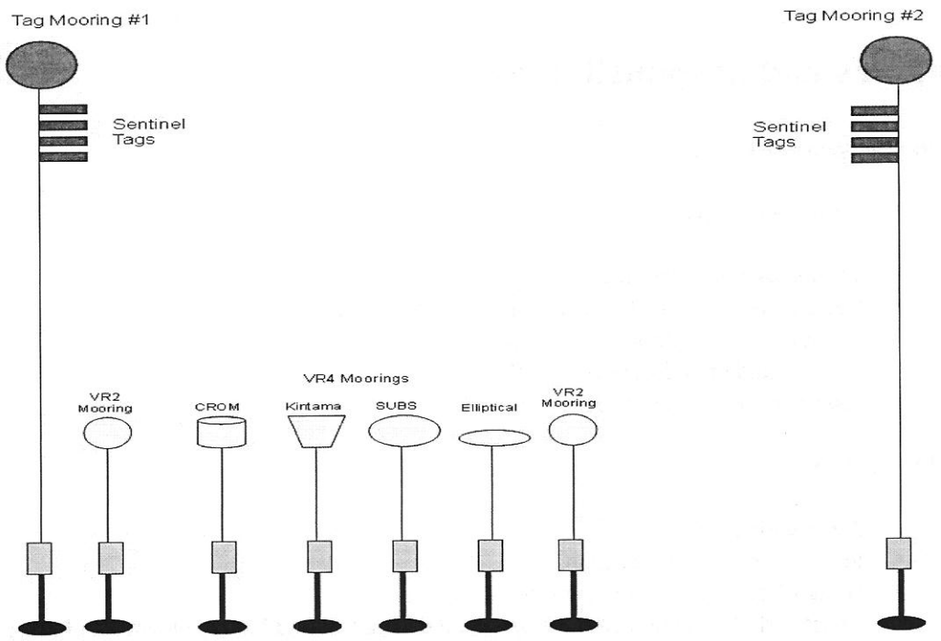


Figure 1 - Test Phase Mooring Design

After the Test phase is complete the cost and performance of each mooring type will be analyzed and the most effective system will be recommended for the Full Deployment phase.

7 - Shipping Details

Dalhousie University will cover costs of shipping the equipment to University of Barcelona. Duties, custom and/or other importation taxes are the responsibility of the Strait of Gibraltar Line Collaborators.

The equipment can be shipped to:

Prof. Miquel Canals
Universitat de Barcelona
Facultat de Geologia
Dept. d'Estratigrafia, Paleontologia i Geociències Marines

GRC en Geociències Marines
Campus de Pebralbes
C/Marti i Franques, s/n
08028 Barcelona
Spain
Tel. +34 93 4021360

8 - Roles and Responsibilities

Gibraltar Deployment Team:

- Design the array;

- Set deployment schedule(s);
- Design one or two test mooring and provide materials;
- Assist in mooring design for final phase;
- Reserve and provide shiptime; and
- Lead deployment activities.

OTN Technician(s):

- Assist with array design;
- Provide a range test tag plan;
- Design 4 or 5 test moorings for test phase;
- Assist with deployment/recovery/upload during test and final deployment phases;
- Provide training and assistance (as required) during test and final phases.

9 - Receiver Replacement

Lost or damaged receivers may be replaced at Dalhousie's discretion according to the terms specified in the Collaborators agreement. One receiver and release have been provided as spares.

10 - Risk Management

The table below identifies the risks associated with the deployment and also identifies how/if the OTN team plans to address these items.

RISK FACTORS	IMPACT	RISK LEVEL	MITIGATION STRATEGIES	STATUS
Faulty Receiver and/or Acoustic Release discovered after partner takes possession of the equipment	1. a hole in the curtain 2. the curtain could be shorter than originally planned 3. Lost equipment 4. Dalhousie could be in non-compliance with the collaboration agreement	Medium	1. A Spare VR4 and release will be provided to the partner.	Complete
Poor mooring design	1. Lost equipment and/or hole(s) in the curtain 2. Environmental hazards	High	1. The test phase is a risk mitigation strategy to test different mooring systems to determine which ones will perform best in that environment.	Complete – Test phase is scheduled.
Collaborator does not provide data and/or metadata or data/metadata of poor quality	1. Data from the line is meaningless or non-existent 2. Data quality compromised	Low	1. Partner awareness of OTN data policy via signed collaboration agreement 2. Employ OTN data quality control procedures	In Progress – partner has signed collaboration agreement

Schedule B - List of Equipment

Description of Good	Serial #	Model #	Qty
ORE Acoustic Release	35948	PORT-MFE	1
ORE Acoustic Release	35951	PORT-MFE	1
ORE Acoustic Release	34862	PORT-MFE	1
ORE Acoustic Release	35857	PORT-MFE	1
ORE Acoustic Release	35949	PORT-MFE	1
ORE Acoustic Release	35520	PORT-MFE	1
ORE Acoustic Release	35859	PORT-MFE	1
ORE deck box and transducer	35954	AMD 200R MF	1
Strongback, fibreglass acoustic release mount	na		1
Acoustic release mounting bracket, plastic	na		2
Acoustic release mounting ring, plastic	na		1
Black plastic VR2W receiver cup and hardware	na		3
Package of 100 black cable ties	na		1
Pair of VR2W opening rods	na		1
Package of 5 dessicant packs	na		4
Plastic bushings	na		8
Magnet	na		1
Stainless steel swivel (1/2")	na		1
Stainless steel shackle	na		1
Hose clamp	na		2
Safety shackle (5/16")	na		24
Hardball float, 16"	na	HBF-016-750	1
Hardball float, 16"	na	HBF-016-750	1
Hardball float, 16"	na	HBF-016-750	1
Benthos VR4-UWM Surface Unit	53420	UDB 9000 Band C	1
VR4-UWM Software Communications Package			1
Vemco Acoustic Receiver	250358	VR4-UWM	1
Vemco Acoustic Receiver	250359	VR4-UWM	1
Vemco Acoustic Receiver	250360	VR4-UWM	1
Vemco Acoustic Receiver	250361	VR4-UWM	1
Vemco Acoustic Receiver	250362	VR4-UWM	1